

REMARKS

Claim 20 has been canceled without prejudice to resubmission. Claims 1, 3, 10, 13 and 17 have been amended. Upon entry of this amendment, claims 1-19 and 21 will remain pending in the present application.

1. Discussion of Claim Amendments

Claim 1 has been amended to require that the piezoelectric crystal is a quartz crystal. Basis for this amendment is found, for example, in previous claim 20 and on page 9, lines 20-23 of the original specification. Claim 1 has also been amended to require that the multiplexer multiplexes the driving device simultaneously to a plurality of acoustic detectors. Basis for this amendment is found, for example, at page 4, lines 25-31 and page 14, lines 7-28 of the original specification. Similar amendments have also been made to claim 10.

Claim 3 has been amended to clarify the antecedent basis for the sample chamber. Claim 10 has been amended to clarify the antecedent basis for the piezoelectric crystal and to correct a typographical error in the spelling of “crystal.” Claim 13 has been amended to correct a typographical error. Claim 15 has been amended to replace “measuring steps” with “measuring step” to clarify the antecedent basis for this limitation. Claim 17 has been amended to clarify the antecedent basis for the acoustic detectors.

No new matter has been added.

2. The Rejection Under 35 U.S.C. §112

Claims 2-4 have been rejected under 35 U.S.C. §112 as being indefinite. Though the Examiner did not reject claims 10, 13, 15 and 17, objections were raised to these claims as well.

The rejection of claim 2 is traversed since there is clear antecedent basis for “each said acoustic detector” in claim 1, from which claim 2 depends, at line 4, i.e. “a plurality of acoustic detectors.” The same argument applies to claims 10 and 13, where antecedent basis for “each said acoustic detector” is found at line 4 of claim 10, i.e. “a plurality of acoustic detectors.”

Claim 3 has been amended to recite “each said sample chamber.” Antecedent basis for this is found in claim 1, line 2, i.e. “a plurality of sample chambers.”

Claim 10 has been amended to recite “each said piezoelectric crystal.” Antecedent basis for this is found in claim 10, lines 4-5, i.e. “each said acoustic detector comprising a piezoelectric quartz crystal...”

Claim 15 has been amended to correct a typographical error by making “said measuring steps” singular. Antecedent basis for “said measuring step” in claim 15 is found in the last line of claim 10, from which claim 15 depends.

Claim 17 has been amended to recite, “each said acoustic detector.” Antecedent basis for this is found at line 4 of claim 10, from which claim 17 depends, i.e. “a plurality of acoustic detectors.”

Favorable consideration and withdrawal of the rejections under 35 U.S.C. §112 is requested.

3. The Rejection of Claims 1, 5-12 and 20 under 35 U.S.C. §103(a)

The present invention, as claimed in claim 1, relates to a multi-channel acoustic measurement device. The device includes a plurality of sample chambers, a controller for controlling one or more conditions of said sample chambers, a plurality of acoustic detectors, a driving device connected to said plurality of acoustic detectors for causing a perturbation of said acoustic detectors, a multiplexer connected between said driving device and said acoustic detectors, and a data device for obtaining data from said acoustic detectors. Each acoustic detector includes a piezoelectric crystal and is located in one said sample chamber. The present invention, as claimed in claim 1, provides a device with the ability to run high throughput screening of multiple samples in parallel. The present amendments to claims 1 and 10 have further defined this capability of the device. In addition, the device of the present invention is excellently suited for use as a 21 C.F.R. Part 11 compliant device, which makes the device useful for collection of data for FDA submissions as well as for data that must be gathered in compliance with this section. See e.g. page 5, lines 27-33 of the specification.

Claims 1, 5-12 and 20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over a combination of U.S. Patent no. 6,182,499 (McFarland et al.) and U.S. Patent application publication no. 2002/0172620 (Potyrailo). This rejection, at least insofar as it applies to claims 1 and 5-12 2, as amended, is respectfully traversed and reconsideration is requested for the reasons which follow. Claim 20 has been canceled without prejudice to resubmission.

McFarland et al. discloses systems and methods for characterization of materials. Some embodiments of McFarland et al. employ plural sample chambers. McFarland et al. includes a temperature control system for controlling the temperature of samples in the sample chambers. McFarland et al. discloses a variety of different detectors, some of which are acoustic detectors. McFarland et al. also mentions driving and data devices.

Claim 1 has been amended to require a multiplexer connected between said driving device and said acoustic detectors to multiplex the driving device simultaneously to a plurality of acoustic detectors. The purpose of this multiplexer is to multiplex the signals provided to oscillate the piezoelectric crystals. Although McFarland et al. discloses the use of a multiplexer, the multiplexer in McFarland et al. is not used to multiplex the signals used to drive the sensors, but rather is employed to multiplex data signals obtained from the sensors and is connected to the control circuit. See e.g. col. 13, lines 31-50 and Fig. 9 of McFarland et al. Thus, McFarland et al. does not disclose this feature of claim 1. Claims 2-9 all depend from claim 1 and thus are considered to be novel over McFarland et al. for at least this reason.

The Examiner relies on paragraph [0047] of Potyrailo as disclosing the use of a single oscillation device to sequentially initiate oscillation for a plurality of acoustic wave devices in the array. The present amendments clarify that the device of the present invention uses the multiplexer to simultaneously initiate oscillation of a plurality of acoustic wave devices. This is different from the sequential oscillation of the Potyrailo device since it allows the taking of multiple measurements in parallel, rather than sequentially as in Potyrailo. This provides a significantly increased throughput for the device of the present invention, relative to the Potyrailo device. See e.g. page 4, lines 25-31 of the present application.

In addition, the switch from multiplexed sequential oscillation as in Potyrailo to parallel multiplexed oscillation as in the present invention is a non-trivial change since it is necessary to overcome the problem of “cross-talk” among the signals to the oscillator in order to implement parallel multiplexed oscillation as in the present invention. Note that the inventors of the present invention developed special circuitry for this purpose as depicted in Figure 13 of the present application.

The same arguments apply to claims 5-9 which depend from claim 1. In addition, the same amendment has been made to claim 10 and thus these same arguments also apply to claims 10-12.

Further, with respect to claim 5, it is noted that this claim requires that the multiplexer be connected to the driving device and to the controller and data device. The multiplexor of McFarland et al. referenced by the Examiner is only connected to the controller. The multiplexer of Potyrailo is only connected to the driving device. There is no reason in McFarland et al. or Potyrailo to connect the multiplexer to both the controller and the driving device.

With respect to claim 8, the Examiner take the position that computer 915 with processor 913 of McFarland et al. could be designated the data validator as they are capable of such. However, the Examiner cites no basis in McFarland et al. indicating that the computer 915 is actually capable of data validation. A computer, without special software or hardware for data validation, is not capable of data validation. Thus, the mere disclosure of a computer 915 in McFarland et al. is not a disclosure of a data validator as claimed in claim 8.

With respect to claim 9, the Examiner alleges that, "...usage of a Fourier transform generator is known for generating complex and continuous waveforms as required by McFarland et al." but cites no evidence in support of this statement. Thus, since this rejection is unsupported by evidence, it should be withdrawn. In addition, in the applicant's experience, conventional frequency generators and network analyzers do not provide suitable waveform generation without significant signal distortion, thereby rendering such devices unsuitable for use as a 21 C.F.R. Part 11 compliant device.

Accordingly, favorable consideration and withdrawal of the rejection of claims 1 and 5-12 in view of the amendments is requested.

4. The Rejection of Claims 2-4, 13-19 and 21 under 35 U.S.C. §103(a)

Claims 2-4, 13-19 and 21 have been rejected under 35 U.S.C. §103(a) as being unpatentable over McFarland et al. in view of Potyrailo, as applied to claims 1 and 5-12, and further in view of U.S. Patent no. 5,041,800 (Long et al.). This rejection is traversed and reconsideration is requested for the reasons which follow.

First, all of claims 2-4, 13-19 and 21 are patentable for the same reasons as given above for claims 1 and 10 since these claims each depend from one of claims 1 and 10 and Long et al. does not cure the deficiencies of McFarland et al. and Potyrailo.

With respect to claim 2, as the Examiner concedes, McFarland et al. does not teach use of a temperature sensor in contact with a surface of the piezoelectric quartz crystal. Instead,

McFarland et al. discloses a thermistor 807 located in the sample itself. As a result, the temperature measurement and control in the McFarland et al. device is far less reliable than in the present invention. This is because McFarland et al. is subject to local temperature variations in the sample liquid, and variations in the thermal conductivity of each sample. The present invention obtains the temperature of the surface of the piezoelectric crystal which is a much more precise and reliable temperature for use in controlling the temperature of the device.

The Examiner relies on Long et al. as teaching a temperature sensor in contact with the sample enclosure. However, this is also different from the present invention since the present invention has a temperature sensor in contact with the acoustic detector. As a result, the temperature measurement and control of the detectors in the Long et al. would be far less reliable than in the present invention. This is because Long et al. measures the temperature on the surface of the enclosure using thermistor 112 which may be significantly different than the temperature on the surface of the detector. Note for example that Long et al. characterizes use of a temperature sensor on the enclosure as providing, “coarse heating control.” See col. 5, lines 30-33 of Long et al. Long et al. also makes it clear that precise temperature control of the detector is very difficult to achieve. See e.g. cols. 1-2 of Long et al. The present invention obtains the temperature of the surface of the piezoelectric crystal which is a much more precise and reliable temperature for use in controlling the temperature of the device. Thus, a combination of McFarland et al. and Long et al. does not realize the structure of claim 2 of the present application. The same arguments apply to claim 13 of the present application.

In regard to claim 3, McFarland et al. does not teach use of separate devices in the block and cover for controlling the temperature of the sample chamber. Long et al. only appears to include a single heating device 102 for the sample enclosure 104 and not separate heating devices for the block and cover of the sample enclosure as required by claim 3 of the present application and thus a combination of McFarland et al. and Long et al. does not realize the structure of claim 3 of the present application.

The features of claims 2-3 and 13 of the present application are important to provide the ability for the device of the present invention to be used as a 21 C.F.R. Part 11 compliant device and thus are very significant. The reason for this is that precise temperature control is necessary to achieve the accurate measurement repeatability required for use as a 21 C.F.R. Part 11

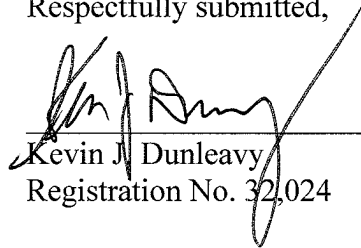
compliant device. Thus, the features of these claims are non-trivial since they enable the present device to be operated with a high degree of accuracy and repeatability.

Accordingly, withdrawal of the rejection of claims 2-4, 13-19 and 21 under 35 U.S.C. 103(a) is requested for these reasons.

Favorable consideration and issuance of a Notice of Allowance is requested.

Respectfully submitted,

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